AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

LISTING OF CLAIMS:

1. (Previously Presented) A method of detecting a face using a pattern classifier having learned face images and near-face images, the method comprising the steps of:

(a) receiving a plurality of face images and a plurality of near-face images and extracting a plurality of face basis vectors expressing the face images and a plurality of near-face basis vectors expressing the near-face images;

(b) extracting face feature vectors and near-face feature vectors by projecting the face images and the near-face images upon the face and near-face basis vectors;

(c) classifying the face feature vectors and the near-face feature vectors into a plurality of predetermined sub-classes;

(d) training a plurality of pattern classifiers that correspond to the plurality of predetermined sub-classes, wherein the pattern classifier corresponding to a certain sub-class is trained using the face feature vectors and near-face feature vectors, which are included in the sub-class; and

(e) extracting a feature vector of an image, which is input for face detection, applying the feature vector of the input image to only one pattern classifier of the plurality of pattern classifiers, wherein the one pattern classifier corresponds to the

sub-class including the feature vector of the input image, and determining whether the input image is a face image using the pattern classifier.

2. (Original) The method of claim 1, wherein step (e) comprises the steps of:

(e1) projecting the input image upon the basis vectors to obtain feature values for the input image and extracting the feature vector of the input image using the feature values;

(e2) determining the sub-class including the feature vector of the input image among the sub-classes; and

(e3) applying the feature vector of the input image to the pattern classifier corresponding to the determined sub-class and determining whether the input image is a face image using the pattern classifier.

3. (Previously Presented) The method of claim 2, wherein step (e1) comprises calculating a residual error representing a difference between the input image and a restored value obtained by multiplying projection coefficients, which are obtained by projecting the input image upon the face basis vectors and the near-face basis vectors, by the basis vectors, and extracting the feature vector of the input image using the projection coefficients and the residual error.

4. (Original) The method of claim 1, wherein step (a) comprises the steps of:

(a1) performing a principle component analysis (PCA) on the plurality of face images and the plurality of near-face images to extract face PCA basis vectors for the face images and near-face PCA basis vectors for the near-face images; and

(a2) performing an independent component analysis (ICA) on the face and near-face PCA basis vectors and outputting face ICA basis vectors as the face basis vectors and near-face ICA basis vectors as the near-face basis vectors.

5. (Original) The method of claim 4, wherein step (a) further comprises storing the face basis vectors and the near-face basis vectors.

6. (Previously Presented) The method of claim 1, wherein step (b) comprises the steps of:

(b1) projecting the face images and the near-face images upon the basis vectors to obtain projection coefficients;

(b2) calculating residual errors representing differences between a restored value obtained by multiplying the projection coefficients by the basis vectors and each of the face and near-face images; and

(b3) extracting the feature vectors of the face and near-face images using the projection coefficients and residual errors.

7. (Original) The method of claim 1, wherein step (c) comprises the steps of:

(c1) measuring a Euclidean distance with respect to each of the face feature vectors and classifying the face feature vectors into the predetermined sub-classes by grouping face feature vectors in accordance with the Euclidean distance, so that face feature vectors which are close to one another in terms of the Euclidean distance belong to the same sub-class; and

(c2) selecting a central face feature vector from face feature vectors belonging to each of the sub-classes according to an average of the face feature vectors.

8. (Original) The method of claim 7, wherein step (c) further comprises measuring a Euclidean distance between the near-face feature vectors and each central face feature vector and classifying the near-face feature vectors into the predetermined sub-classes by grouping near-face feature vectors in accordance with the Euclidean distance so that near-face feature vectors which are close to a predetermined central face feature vector in terms of the Euclidean distance belong to a sub-class including the predetermined central face feature vector.

9. (Original) The method of claim 1, wherein step (c) comprises classifying the face feature vectors into the predetermined sub-classes using a k-means clustering algorithm.

10. (Currently Amended) ~~A recording medium on which the method of claim 1 is recorded in the form of program codes which can be executed in a computer~~ A program on a tangible computer-readable recording medium which can be executed on a computer to carry out a method of claim 1.

11. (Canceled)

12. (Previously Presented) A system for detecting a face using a pattern classifier having learned face images and near face images, the system comprising:

a basis vector extractor, which receives a plurality of face images and a plurality of near-face images and extracts a plurality of face basis vectors expressing the face images and a plurality of near-face basis vectors expressing the near-face images;

a feature vector extractor, which extracts face feature vectors and near-face feature vectors by projecting the face images and the near-face images upon the face and near-face feature vectors and projects an image, which is input for face detection, upon the basis vectors to extract the feature vector of the input image;

a clustering unit, which classifies the face feature vectors and the near-face feature vectors into a plurality of predetermined sub-classes and outputs a sub-class number of a sub-class including the feature vector of the input image among the sub-classes;

a pattern classifier trainer, which trains a plurality of pattern classifiers that correspond to the plurality of predetermined sub-classes, wherein the pattern classifier corresponding to a certain sub-class is trained using the face feature vectors and near-face feature vectors, which are included in the sub-class; and

a face determiner, which applies the feature vector of the input image to only one pattern classifier of the plurality of pattern classifiers, wherein the one pattern classifier corresponds to the sub-class number including the feature vector of the input image and determines whether the input image is a face image using the pattern classifier.

13. (Original) The system of claim 12, wherein the basis vector extractor comprises:

a principle component analysis (PCA) basis vector extractor, which performs PCA on the plurality of face images and the plurality of near-face images to extract face PCA basis vectors for the face images and near-face PCA basis vectors for the near-face images; and

an independent component analysis (ICA) basis vector extractor, which performs ICA on the face and near-face PCA basis vectors and outputs the face basis vectors and the near-face basis vectors.

14. (Original) The system of claim 13, wherein the basis vector extractor further comprises:

a face basis vector storage unit, which stores the face basis vectors; and

a near-face basis vector storage unit for storing the near-face basis vectors.

15. (Original) The system of claim 12, wherein the feature vector extractor:

obtains projection coefficients by projecting the face images, the near-face images, and the input image upon the face basis vectors and the near-face basis vectors;

obtains residual errors representing differences between each of the face images, the near-face images, and the input image and a restored value, which is obtained by multiplying the projection coefficients by the basis vectors; and

extracts the face feature vectors, the near-face feature vectors, and the feature vector of the input image using the projection coefficients and the residual errors.

16. (Original) The system of claim 12, wherein the clustering unit:

measures a Euclidean distance with respect to each of the face feature vectors;

classifies the face feature vectors into the predetermined sub-classes by grouping face feature vectors in accordance with the Euclidean distance, so that face feature vectors which are close to one another in terms of Euclidean distance belong to the same sub-class; and

selects a central face feature vector from face feature vectors belonging to each of the sub-classes according to an average of the face feature vectors.

17. (Original) The system of claim 16, wherein the clustering unit measures a Euclidean distance between the near-face feature vectors and each central face feature vector and classifies the near-face feature vectors into the predetermined sub-classes by grouping near-face feature vectors in accordance with the Euclidean distance, so that near-face feature vectors which are close to a predetermined central face feature vector in terms of the Euclidean distance belong to a sub-class including the predetermined central face feature vector.

18. (Original) The system of claim 16, wherein the clustering unit measures a Euclidean distance between the feature vector of the input image and each central face feature vector and allocates the feature vector of the input image to a sub-class, which includes the central face feature vector that is closest to the feature vector of the input image.

19. (Original) The system of claim 16, wherein the clustering unit classifies the face feature vectors into the predetermined sub-classes using a k-means clustering algorithm.

20. (Canceled)